# PROPOSAL FOR GROUNDWATER MONITORING

7100 Second Avenue South
Seattle, Washington

Prepared for:

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# GROUNDWATER MONITORING PROPOSAL

for property located at:
7100 Second Avenue South
Seattle, Washington

## 1.0 PURPOSE AND OBJECTIVES

The purpose of this proposal is to define a program of groundwater monitoring to be conducted by Environmental Services, Ltd. (ESL) at the Alaska Marine Lines, Inc. (AML) property at 7100 Second Avenue South in Seattle and to present a cost estimate for the initial round of sampling, analysis, and reporting.

The objectives of the monitoring program are to:

1) verify the presence or absence of petroleum contaminants in the groundwater;

2) determine the characteristics and lateral extent of the contaminants in the groundwater;

3) monitor the groundwater dynamics;

4) keep AML informed of our activities, progress, and findings, and make recommendations for future monitoring or cleanup activities.

## 2.0 BACKGROUND

A) Site Assessment Results

Following the removal of three underground storage tanks (USTs) in 1984 and 1991, Dames and Moore (D & M) conducted a Site Assessment of this property. In their report dated March 6, 1991, D & M concluded the following:

1) "Oil is the principal hydrocarbon present in the soil and concentrations up to 3600 mg/kg (measured in total petroleum hydrocarbons, TPH) were identified. The vertical depth of the oil occurrence is at least 30 feet in two areas of the site and undefined in other areas of the site. The lateral extent appears to exceed an area of approximately 150 X 150 feet". Based on the determination that concentrations of oil in the soil below the water table were relatively high (3600 mg/kg), but were relatively low (0.59 mg/liter) in the groundwater itself, the oil was surmised to be historical waste oil that may be stable in the subsurface environment;

2) "Gasoline components benzene, toluene, ethylbenzene and xylene (BTEX) in the soils were largely non-detectable except in samples collected near Tank-2. The BTEX levels that have been identified do not exceed MTCA cleanup criteria";

3) Petroleum hydrocarbon levels in the groundwater did not exceed Model Toxics Control Act (MTCA) cleanup criteria (1 mg/liter). Acceptable benzene and xylene levels (5 ug/liter and 20 ug/liter, respectively) were exceeded in groundwater samples from monitoring wells MW-3 and 4. Because these wells are located close to the location of the previously-removed gasoline tanks, it was concluded that the tanks were the source of the BTEX and, therefore, the contamination found is a residual of the original source.

4) Analyses of water samples from other monitoring wells both up and downgradient from the former location of the tanks showed no detectable levels of BTEX, verifying the source and indicating that the BTEX contamination had a limited lateral extent.

5) Analysis of samples from monitoring wells located between the Duwamish Waterway and the former tank locations showed no detectable levels of BTEX, indicating there was no immediate threat to the Waterway.

B) Quarterly Groundwater Monitoring Program

Based on the recommendations of D & M, AML contracted for groundwater monitoring on a quarterly basis for one year. Table 3 (Appendix 1) is a summary of the laboratory analyses of water samples from the seven wells. Figure 1 (Appendix 1) is a Groundwater Contour Map based on well readings for August 14, 1992, the latest sampling date.

## 3.0 CONCLUSIONS AND RECOMMENDATIONS

The following conclusions are drawn from the D & M data.

A) Laboratory analyses of water samples show elevated levels of benzene from monitoring wells MW-2, 3, and 4, and, possibly, elevated levels of diesel range hydrocarbons from MW-6 and 7 (although the laboratory analyst concluded there was no chromatographic pattern match for diesel fuel or gasoline). At one point, samples from MW-3 and 4 contained significantly elevated levels of xylene, and from MW-7, toluene; however, these concentrations have dropped to within MTCA acceptable limits. The fact that monitoring wells 2, 3 and 4 are the wells closest to the former tank locations is consistent with the determination that the tanks are the source of the BTEX contaminants. Based on the trends presented in this data, it is almost certain that the level of diesel range hydrocarbons is now below MTCA acceptable limits.

B) Based on groundwater level measurements, there appears to be a northwest-southeast trending divide in the groundwater table that changes position slightly as a function of tidal levels. Over a tidal cycle, groundwater to the east of MW-7 flows toward the Duwamish; water to the west of the divide flows toward the former UST site, with the net gradient toward the river. Groundwater flow rates are estimated by D & M to be 0.02 to 0.06 feet per day. The horizontal distance between MW-4 and the Duwamish is 130 feet. Therefore, the predicted travel time of the contaminants to the Duwamish is 5.9 to 18.6 years (D & M estimate 10 years).

However, the tidal influence on the localized groundwater table between the source and the Duwamish increases this transit time by an unknown amount. Based on the groundwater dynamics, there is no immediate threat to the Duwamish.

C) The 2nd Avenue site is located in the midst of a heavy industrial area. Groundwater is not used as a source of potable water here. In addition, the property is completely paved. There is, therefore, no risk to human health, other than the very slight risk of exposure of personnel to the contaminants if groundwater should be encountered during construction activities.

D) Further monitoring is necessary before any conclusions can be drawn regarding patterns of migration and concentration levels of the benzene contamination at this site. Data should be collected for a period of several years before a determination is made regarding the necessity for further geotechnical modeling and interpretation.

## 4.0 SCOPE OF WORK

Initial ESL sampling of groundwater from the seven monitoring wells will be conducted in August, 1993. Samples will be analyzed by a Washington State certified laboratory using analytical method WTPH-G/BTEX.

Groundwater levels in the seven existing monitoring wells will be measured prior to sampling, as will the dockside level of the Duwamish Waterway. Groundwater collected during the purging of the wells will be disposed of in accordance with Washington Dept. of Ecology regulations.

A report containing the results of the laboratory analyses, a groundwater surface contour and sample location map, explanations of the findings, and recommendations for future actions will be prepared for and submitted to Alaska Marine Lines, Inc. after the final laboratory analytical results are obtained.

Future sampling and analyses should be conducted annually. Please note that the 1994 sampling event and all subsequent sampling events are beyond the scope of the cost estimate (Section 5.0) that is included in this proposal. Prior to the initiation of each sampling event, ESL will submit a cost estimate for AML's approval.

## 5.0 ESTIMATED COSTS

| | |
|---|---|
| Groundwater Sampling and Testing | $1,528 |
| Teflon bailers, disposal drums, etc. | $ 210 |
| Use of water level sensor | $ 100 |
| ESL field effort | $1,160 |
| Water disposal | $ 58 |
| Laboratory Analyses | $ 874 |
| WTPH-G/BTEX | $ 765 |
| Quality Control | $ 109 |
| Data Analysis and Report Preparation | $2,180 |
| Principal | $ 440 |
| Senior Geologist | $ 800 |
| Hydrogeologist | $ 340 |
| Drafting | $ 300 |
| Technical editing | $ 300 |
| Insurance | $ 115 |
| **GRAND TOTAL** | **$4,697** |

# APPENDIX 1

# DAMES AND MOORE SAMPLING DATA

TABLE 3
SUMMARY OF GROUND-WATER ANALYTICAL DATA
7100 2nd Avenue
Alaska Marine Lines

| WELL NO. | DATE | Analysis | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | TPH ppm | TPH-D[1] ppm | TPH-G[2] ppm | Benzene ppb | Toluene ppb | Ethylbenzene ppb | Xylenes ppb |
| MW1 | 11/1/90 | 0.59 | NA | NA | <1.0 | <1.0 | <1.0 | <1.0 |
| | 12/18/90 | NA | NA | NA | | NA | NA | NA |
| | 9/5/91 | <10.0 | NA | NA | <1.0 | <1.0 | <1.0 | <2.0 |
| | 1/10/92 | <2.0 | NA | NA | <1.0 | <1.0 | <1.0 | <2.0 |
| | 4/9/92 | NA | <0.25 | <0.25 | <1.0 | <1.0 | <1.0 | <2.0 |
| | 8/16/92 | NA | <0.25 | <0.25 | <1.0 | <1.0 | <1.0 | <2.0 |
| MW2 | 11/1/90 | 0.56 | NA | NA | <1.0 | <1.0 | <1.0 | <1.0 |
| | 12/18/90 | NA | NA | NA | NA | NA | NA | NA |
| | 9/5/91 | NA | NA | NA | 88 | <1.0 | <1.0 | <2.0 |
| | 1/10/92 | <2.0 | NA | NA | 110 | <1.0 | <1.0 | <2.0 |
| | 4/9/92 | NA | 0.58 | 0.14J[1] | 65 | <1.0 | <1.0 | <2.0 |
| | 8/16/92 | NA | <0.25 | <0.25 | 94 | <1.0 | <1.0 | <2.0 |
| MW3 | 11/1/90 | 0.33 | NA | NA | <1.0 | <1.0 | 1.1 | 5.3 |
| | 12/18/90 | NA | NA | NA | 420 | 3.5 | 13 | 48.4 |
| | 9/5/91 | <10.0 | NA | NA | 630* | 3.2 | 16 | 25 |
| | 1/10/92 | <2.0 | NA | NA | 500* | 3.8 | 14 | 17 |
| | 4/9/92 | NA | <0.25 | 0.72[1] | 620* | 3 | 9.1 | 18 |
| | 8/16/92 | NA | 0.30[1] | 0.31[1] | 910* | 3.2 | 9.4 | 15 |
| MW4 | 11/1/90 | 0.27 | NA | NA | 4200 | 8.3 | 2.1 | 4.2 |
| | 12/18/90 | NA | NA | NA | 3600 | <50 | <50 | 63 |
| | 9/5/91 | <10.0 | NA | NA | 2000 | 12 | <1.0 | 19 |
| | 1/10/92 | <2.0 | NA | NA | 2700* | 11 | 4.1 | 17 |
| | 4/9/92 | NA | <0.25 | 0.15J[1] | 1800* | 6.2 | <1.0 | 5.7 |
| | 8/16/92 | NA | <0.25 | 0.22J[1] | 3400* | 12 | 4.6 | 19 |

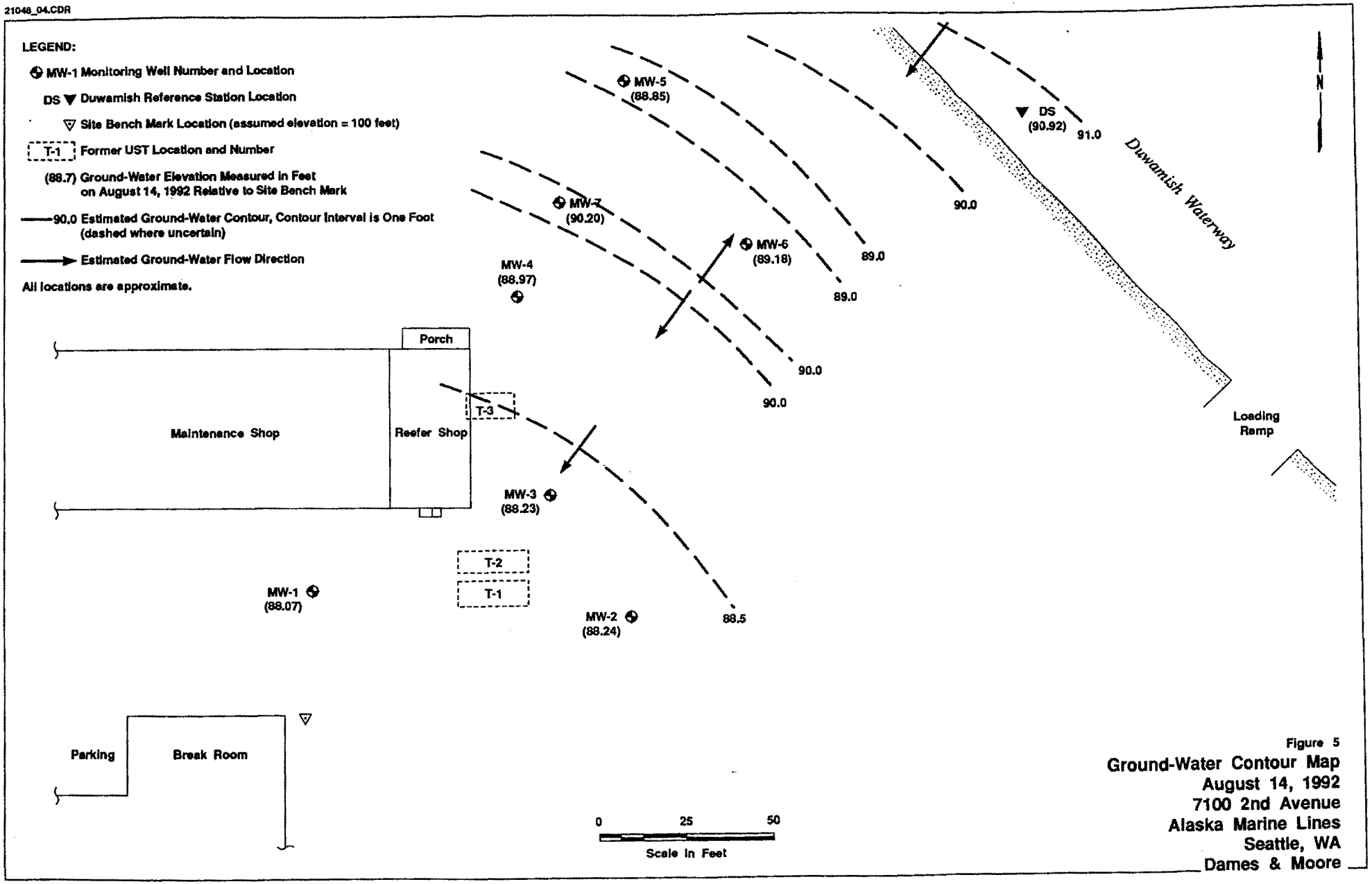
TABLE 3
SUMMARY OF GROUND-WATER ANALYTICAL DATA
(Cont.)

| WELL NO. | DATE | Analysis | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | TPH ppm | TPH-D[1] ppm | TPH-G[2] ppm | Benzene ppb | Toluene ppb | Ethylbenzene ppb | Xylenes ppb |
| MW5 | 11/1/90 | NA | NA | NA | NA | NA | NA | NA |
| | 12/18/90 | NA | NA | NA | <5.0 | <5.0 | <5.0 | <5.0 |
| | 9/5/91 | NA | NA | NA | NA | NA | NA | NA |
| | 1/10/92 | <2.0 | NA | NA | <1.0 | <1.0 | <1.0 | <2.0 |
| | 4/9/92 | NA | <0.25 | <0.25 | <1.0 | <1.0 | <1.0 | <2.0 |
| | 8/16/92 | NA | 0.28[1] | <0.25 | <1.0 | <1.0 | <1.0 | <2.0 |
| MW6 | 11/1/90 | NA | NA | NA | NA | NA | NA | NA |
| | 12/18/90 | NA | NA | NA | <5.0 | <5.0 | <5.0 | <5.0 |
| | 9/5/91 | NA | NA | NA | NA | NA | NA | NA |
| | 1/10/92 | <2.0 | NA | NA | <1.0 | <1.0 | <1.0 | <2.0 |
| | 4/9/92 | NA | **4.2**[1] | <0.25 | <1.0 | <1.0 | <1.0 | <2.0 |
| | 8/16/92 | NA | **1.1**[1] | <0.25 | <1.0 | <1.0 | <1.0 | <2.0 |
| MW7 | 11/1/90 | NA | NA | NA | NA | NA | NA | NA |
| | 12/18/90 | NA | NA | NA | <5.0 | <5.0 | <5.0 | <5.0 |
| | 9/5/91 | <10.0 | NA | NA | 3.4 | 79 | <1.0 | <2.0 |
| | 1/10/92 | <2.0 | NA | NA | 1.7 | 4.2 | <1.0 | <2.0 |
| | 4/9/92 | NA | **6.6**[1] | <0.25 | 1.6 | <1.0 | <1.0 | <2.0 |
| | 8/16/92 | NA | 0.73[1] | <0.25 | 1.1 | 22 | <1.0 | <2.0 |
| MTCA[2] | | 1 | 1 | 1 | 5 | 40 | 30 | 20 |

1 - In the opinion of the laboratory analyst, there was no chromatographic pattern match for diesel or gasoline.
2 - MTCA - The Model Toxics Control Act Cleanup Regulation, effective February 28, 1991.
J - Indicates an estimated value when result is less than specified detection limit.
< - This parameter was not detected at a concentration above the detection level indicated in the table.
NA - Not Analyzed
* - Indicates the initial analysis of the sample was above the linear range of the analytical instrument. The value shown is the concentration obtained following the required dilution.
ppm - parts per million
ppb - parts per billion

Numbers in bold indicate a concentration at or above the MTCA cleanup levels.

21048_04.CDR




Job No. 21048-005-005

Figure 5
Ground-Water Contour Map
August 14, 1992
7100 2nd Avenue
Alaska Marine Lines
Seattle, WA
Dames & Moore